United States Department of Agriculture

Renovation of Crested Wheatgrass Rangeland, Platte County, WY

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Objective: Renovate and diversify crested wheatgrass rangeland
County: Platte County
Average Annual Precipitation: 11 – 14 inches
MLRA: 67A, Central High Plains, Northern Part
Dominant Soil Types: Cedak/Recluse very fine sandy loam, Cedak/Treon fine sandy loam, Julesburg-Jayem-Phiferson fine sandy loam, and Orpha fine sand
Elevation: 5020 ft
Site Preparation: Two different site preparations were used, see details below
Seeding Date: Cool-season cover crop: April 2018, 2019, and 2020; Perennial mix: April 2019 and 2021
Seeding Method: Min-till drill seeder, 7.5 inch row spacing
Acres Seeded: 20 acres
Previous Site History: grazed crested wheatgrass rangeland
Herbicide: May 2018: 2,4-D applied for fringed sage control; glyphosate applied for cheatgrass and other annuals control. Spring 2020: glyphosate. Spring 2021: Glyphosate on site prep 1, 3 years cover crop.
Irrigation: None
Grazing: Wildlife and cattle
Monitoring Dates: June 2018, 2019, 2020, and 2021

Fig. 1. Site preparation and emergence of seeded species in drill rows, May 2018.

Introduction:
The rangeland site was seeded to crested wheatgrass approximately 50 years ago and needed renovation to improve forage quality and quantity, and rangeland health. The existing plant community was 30% crested wheatgrass, 25% fringed sage, 15% blue grama, 15% threeawn, 10% cheatgrass, and other annuals. Since 2010, the 20 acres have been fenced and typically grazed mid-May for 5 to 10 days with rest the remainder of the year.

This project tested three different site preparations for converting the crested wheatgrass plant community to diverse perennial vegetation. Cover crops were used prior to seeding desired perennial vegetation to prevent re-establishment of crested wheatgrass and weeds while providing some limited grazing. The cover crop was monitored in June 2018, 2019, and 2020 for species density, cover, height, and production (Table 3). The site preparations were:

1. *Three Years Cover Crops*: Disk ground in early spring 2018 following herbicide treatment. Follow with successive cool season cover crops seeded in early April 2018, 2019, and 2020 with glyphosate applied prior to seeding (Table 1). Summer grazing June-July prior to seed head development in all years. Seed perennial species spring 2021 (Table 2). Rest from grazing 2021.
2. *One Year Cover Crop*: Disk ground in early spring 2018 following herbicide treatment. Seed cool season cover crops April 2018, grazing two weeks in November, overwinter, and seed perennial species spring 2019 (Table 2). Rest from grazing 2021.
3. *Disk Treatment*: Disk ground in early spring 2018 following herbicide treatment. Broadcast seeded alfalfa (2 lb/ac) and switchgrass (3 lb/ac) in April 2018.

Table 1. Cover crop species seeded in April 2018, 2019, and 2020.

Common Name	Scientific Name	Cultivar	2018 lbs PLS/acre	2019 lbs PLS/acre	2020 lbs PLS/acre
Collards	*Brassica oleracea*	Impact forage	0.75	-	-
Field pea	*Pisum sativum var. arvense*	Montech	5.88	12.5	30
Indian mustard	*Brassica juncea*	Indi gold	0.75	-	-
Lentil	*Lens culinaris*	Indianhead	1.75	-	-
Turnip	*Brassica rapa*	Purple top	0.63	0.5	-
Radish	*Raphanus sativus*	Grazafodder	0.75	0.3	-
Spring oats	*Avena sativa*	VNS	9.88	9.0	40
Spring triticale	*Triticum x Triticosecale*	VNS	7.88	-	-
Sunflower Black Oilseed	*Helianthus annuus*	Common	-	0.5	-
Spring Barley	*Hordeum vulgare*	Hays	-	12.5	-
Crimson Clover	*Trifolium incarnatum*	VNS	-	1.5	-
Buckwheat	*Fagopyrun esulentum*	VNS	-	3.75	-

Table 2. Perennial vegetation seeded following cover crops or disk treatment.

Common Name	Scientific Name	Cultivar	lbs PLS/acre
Green needlegrass	*Nassella viridula*	Lodorm	0.6
Pubescent wheatgrass	*Thinopyrum intermedium*	Luna	2.5
Orchardgrass	*Dactylis glomerata*	Pauite	0.3
Sideoats grama	*Bouteloua curtipendula*	Butte	4.5
Sand bluestem	*Andropogon gerardii*	Goldstrike	0.4
Sand lovegrass	*Eragrostis trichodes*	Nebraska 27	0.05
Streambank wheatgrass	*Elymus lanceolatus*	Sodar	0.6
Switchgrass	*Panicum virgatum*	Dacotah	0.1
Blanketflower	*Gaillardia aristata*	Common	0.01
Cicer milkvetch	*Astragalus cicer*	Lutana	0.35
Flax, blue	*Linum lewisii*	Appar	0.03
Prairie coneflower	*Ratibida columnifera*	Common	0.02
Sainfoin	*Onobrychis viciifolia*	Shoshone	5.1
Small burnet	*Sanguisorba minor*	Delar	0.2

Fig 2. Cattle grazing the third year of cover crops consisting of oats and peas.

Results:

Three Years Cover Crop Treatment: The site preparations and adequate spring moisture resulted in good establishment of the cover crop in 2018 and 2019 (Table 3, Fig 3). In 2018, spring oats and triticale were tall plants with high forage production but low canopy cover. Adding broadleaf species like Indian mustard, field pea, and purple top turnip provided good canopy cover for protection from wind erosion, and they had high production. Other cover crop species established in low densities but add diversity and nutrients to the site. In addition, the cover crop reduced weed establishment. Weeds of note in 2018 were cheatgrass and yellow sweetclover with 62 lbs/ac and 173 lbs/ac, respectively.

In 2019, the spring barley and spring oats had the highest production of the seeded species (Table 3). Field pea and volunteer spring triticale had only 100 lbs/ac of production. The turnip, crimson clover, buckwheat and sunflower were present on the site but were being shaded by the yellow sweetclover. Yellow sweetclover benefited from the spring precipitation, was over three feet tall, and was 56% of the species composition by weight on the site accounting for 1,726 pounds per acre (Fig 4). Where yellow sweetclover was mowed or less dense, the seeded cover crop species were larger plants (Fig 5). Crested wheatgrass remained on the site but was only 19 lbs/acre and 1% composition by weight.

Fig. 3. The 2018 cover crop established well providing good erosion control and forage, June 2018.

In 2020, precipitation was below average with only 5 inches of precipitation during the growing season but the cover crop still produced adequate production with 1100 and 350 lbs/ac of oats and peas, respectively (Fig 2). Cheatgrass was an issue on the site in 2020. To prepare the site for perennial species in 2021, a herbicide and disk treatment were applied in April 2021. Perennial seeded species were cool and warm season grasses, two legumes and three forbs. Unfortunately, 2021 was also a drought year and seeded perennial species were struggling while warm season weeds (e.g. witchgrass, Russian thistle, etc.) and yellow sweetclover expanded on site.

Table 3. Cover crop species canopy cover, height, and forage production, June 2018, July 2019 and July 2020.

Common Name	Spring Mix 2018			Spring 2019		Spring 2020
	Canopy Cover (%)	Production (lbs/ac)	Height (inches)	Production (lbs/ac)	Height (inches)	Production (lbs/ac)
Collards	2	53	-	-	-	-
Field pea	4	82	23	119	6	350
Indian mustard	12	150	35	-	-	-
Lentil	1	22	-	-	-	-
Turnip	23	641	13	36	-	-
Radish	4	63	8	48	2	-
Spring oats	5	996	31	260	16	1100
Spring triticale	1	281	27	150	32	-
Sunflower	-	-	-	41	12	-
Spring barley	-	-	-	550	14	-
Crimson clover	-	-	-	42	11	-
Buckwheat	-	-	-	trace	3	-

One Year Cover Crop: In 2020, the area with one year of cover crop followed by perennial species seeding developed a decent stand of alfalfa (68% vegetative composition, 436 lb/ac production) but seeded perennial grass species were struggling with only 7% composition total. Cheatgrass established on the site in 2020 and 3 oz/ac of imazapic was applied early September 2020. Alfalfa dominated the site in 2021 with 1400 lb/ac. Perennial grasses increased slightly over 2020, with volunteer crested wheatgrass the dominant species.

Disking: The perennial species established in 2019 but were small and over-topped by dense yellow sweetclover (Fig 3). In 2020, alfalfa was 14% vegetative composition (148 lb/ac) and seeded grasses were only 2% composition. Crested wheatgrass had high vigor with 77% composition and 850 lbs/ac production. In

2021, alfalfa increased in production to 240 lb/ac production and switchgrass increased to 35 lb/ac primarily due to more vigorous, mature plants. As expected, crested wheatgrass is the dominant grass and produced 860 lb/ac production. The disked site still has fringed sage at 65 lb/ac and cheatgrass at 10 lb/ac after applying 3 oz/ac of imazapic in early September 2020.

Fig. 4. In 2019, yellow sweetclover had a high production year and it overtopped the seeded perennial grasses in the one year cover crop treatment.

Fig. 5. In 2019, seeded cover crop grasses and turnips were large, more robust plants where yellow sweetclover was less dense.

Summary:

- The disking provided good seedbed preparation by reducing cover of created wheatgrass and opening the site for seeding. The percent composition (1%) and production (19 lbs/ac) of crested wheatgrass remained low the second year after disking and seeding cover crop. However crested wheatgrass has increased in vigor and production and is dominate in 2021, which was expected. Switchgrass has established and produced 35 lb/ac in 2021.
- Cover crop species established well on the range site prior to seeding perennial species.
- Spring oats, spring triticale, spring barley, spring pea and turnip had high production.
- Broadleaf species, Indian mustard and purple top turnip, had high canopy cover in 2018 which can provide good erosion control.
- High yellow sweetclover production in 2019 and 2020 reduced the production of the seeded cover crop and perennial mix. Seeded species were present but had low production.
- By 2020 and 2021, warm season weeds and yellow sweetclover dominated the sites.
- Based on the results of this field trial, cool season cover crops used for multiple years are not recommended for re-establishing diverse perennials into crested wheatgrass stands, especially when warm season weeds are in the area.
- Future field trails should test warm season cover crop species as a site preparation prior to seeding perennial species in crested wheatgrass stands. The warm season cover crops may be more competitive with the warm season weeds.
- The treatment the producer is most satisfied with is the disk treatment where perennial species were broadcast seeded directly following a disking of crested wheatgrass stand. Alfalfa and switchgrass are present on the site and crested wheatgrass vigor and production increased. This treatment was the cheapest and least labor intensive of the mechanical treatments.